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(54) ORIENTATION TREATMENT OF ORIENTED FILM OF LIQUID CRYSTAL DISPLAY ELEMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To maintain the cleanliness of stages and to easily execute the orientation treatment of an oriented film without contaminating the oriented film in an orientation treatment stage by irradiating a surface formed with the oriented film consisting of a photoorientable polymer on a substrate by using a prism which releases light in multiple directions.

SOLUTION: The oriented film 22 consisting of the photoorientable polymer is first formed on a substrate 21. When the oriented film is irradiated the light by using the pyramidal prism 23 to refract incident light in the multiple directions, the light passes the prism 23 and the oriented film 22 is irradiated with this light at a specified angle, by which the oriented film is oriented. Prisms 23 formed to prism shapes including polygonal pyramid shape, such as triangular prism shapes and quadrangular pyramid shapes or the shapes in addron formed by cutting the front ends of the polygonal pyramids or the polygonal poles, such as triangle pole and quadrangle poles are preferably used. Polyvinyl cinnamate, polyvinyl methoxycinnamate, polyimide, etc., are preferably used as the photoorientable polymer. As a result, the orientation of the oriented film with just one time of the photoirradiation is made possible.



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CLAIMS

[Claim(s)]

[Claim 1]An orientation treatment method of an orienting film characterized by comprising the following.  
A stage which forms on a substrate an orienting film which consists of photo-oriented polymer.  
A stage which irradiates a field which is said substrate and is provided with said orienting film using an optical refraction means which makes light emit to multiple directions.

[Claim 2]An orientation treatment method of the orienting film according to claim 1, wherein said optical refraction means is many pyramid-like prism.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the orientation treatment method of the orienting film which is applied to the orientation treatment method of the orienting film of a liquid crystal display element, maintains the clean nature of a process, and is easy to carry out.

[0002]

[Description of the Prior Art] The usual liquid crystal display element has the following structures.

[0003] The predetermined interval was isolated and it has countered, and also a transparent electrode layer is formed on a lower substrate, it is, and the orienting film (alignment layer) for the orientation of a liquid crystal is formed in the upper part of this transparent electrode layer. And the liquid crystal layer is formed between the orienting films on said and a lower substrate.

[0004] In a liquid crystal display element which was mentioned above, the arrangement of a liquid crystal changes with the propriety of external voltage impressing, and the light of the exterior which flows into a liquid crystal display element by the array change of such a liquid crystal is intercepted and penetrated. That is, an electric field will be formed in a liquid crystal layer if voltage is impressed to said transparent electrode layer. As a result, orientation of the liquid crystal will be carried out to a certain direction, the light which flows into the inside of the liquid crystal of a display device by the propriety of the orientation of a liquid crystal will be intercepted or penetrated, and an image will be embodied by the display screen film.

[0005] The characteristic [like a light transmittance state, speed of response, an angle of visibility, and contrast according to the arrangement characteristic of a liquid crystal element] such whose a liquid crystal display element is is determined. Therefore, it is dramatically important to control the orientation of a liquid crystal element uniformly.

[0006] The uniform oriented state of a liquid crystal is a stake for obtaining a liquid crystal only by making it intervene between lower substrates upwards simply. Therefore, an orienting film will be formed in the upper part of a transparent electrode layer so that the structure of the liquid crystal display element mentioned above may show.

[0007] Generally an orienting film will have a function to which orientation of the liquid crystal element is carried out by carrying out orientation treatment in the stage of the last in the manufacturing process. As such an orientation treatment method, the rubbing method has been used abundantly. That is, it consists of a stage which carries out rubbing of said orienting film with the cloth of a special form, after forming on a substrate the orienting film which consists of polymers.

[0008] Methods developed these days include the orientation method (photo alignment method) for using light. It will be as follows if a photo alignment method is explained based on drawing 1.

[0009] First, the orienting film 12 which consists of photo-oriented polymers is formed on the substrate 11. If said orienting film 12 is locally irradiated using the photo mask 13, the photo-oriented polymers of the orienting film of a concerned area will be arranged. Then, to other fields of an orienting film, it should irradiate with light again using the photo mask 13.

[0010] Among the orientation treatment methods mentioned above, the rubbing method has [that it is easy to carry out] a simple process, and can carry out orientation treatment of the liquid crystal of a large area at once. However, there is a possibility of microscopic particles or fibrin seceding from the cloth of the special form used at the time of rubbing, and making an orienting film polluting. And according to orienting film material, orientation may not become good, and there is a problem which a thin film transistor damages with the static electricity generated at the time of rubbing.

[0011] The clean nature of a process is maintained without static electricity generating a photo alignment method. However, since the optical irradiation steps using a photo mask should be repeated several times as mentioned above, there is a problem that it is troublesome on manufacture.

[0012]

[Problem(s) to be Solved by the Invention] Solve said problem, and the clean nature of a process is maintained, and the purpose of this invention is to provide the orientation treatment method of the orienting film which is easy to

carry out.

[0013]

[Means for Solving the Problem]An orientation treatment method of an orienting film including a stage which forms on a substrate an orienting film which consists of photo-oriented polymer in this invention in order to attain said purpose, and a stage which irradiates a field which is said substrate and is provided with said orienting film using an optical refraction means which makes light emit to multiple directions is provided.

[0014]It is preferred to use prism of a form where a tip part of many prismatic forms, such as the shape of many pyramids, such as a triangular pyramid and a pyramid, a triangular prism, and a square pole, or many pyramids was cut, as said optical refraction means.

[0015]Said photo-oriented polymer in particular is not restricted, and The polyvinyl cinnamate (polyvinyl cinnamate), It is preferred to use the conventional photopolymer (photopolymer) like polyvinyl octyl methoxycinnamate (polyvinyl methoxycinnamate) and polyimide.

[0016]

[Embodiment of the Invention]Based on drawing 2, the orientation treatment method of the orienting film by this invention is explained.

[0017]First, the orienting film 22 which consists of photo-oriented polymer is formed on the substrate 21. It irradiates with light using the prism 23 of the shape of many pyramids of an optical refraction means. Here, said prism 23 has a form where make multiple directions refracted and it deals in incident light.

[0018]When it is made to irradiate with light using such multiple prism, light will pass the prism 23, will irradiate the orienting film 22 with it with a definite angle, and will carry out orientation of the orienting film. In drawing 2, a solid line shows the course of incident light and a dotted line shows the course of the light which passed prism.

[0019]Hereafter, although this invention is explained in detail based on an example, it is not that this invention is limited only to the following example.

[0020]It was made to dry and the orienting film was formed, after coating the <example> ITO electrode and also applying the constituent containing polyvinyl cinnamate and N-methyl pyrrolidone on a lower glass substrate. And it irradiated with about 365-nm ultraviolet rays, after installing pyramid-like prism in the upper part of said substrate.

[0021]Where a fixed gap is maintained using a spacer, the two-sheet top and the lower substrate were joined, and the empty cell was manufactured. Then, the liquid crystal display element was completed by injecting a liquid crystal into said empty cell.

[0022]It was made to dry and the orienting film was formed, after coating the <comparative example> ITO electrode and also applying the constituent containing poly vinyl cinnamate and N-methyl pyrrolidone on a lower glass substrate.

[0023]And it irradiated with about 365-nm ultraviolet rays, after locating a photo mask in the upper part of the 1 side of said substrate, or a certain field. Subsequently, after locating a photo mask in the other sides of said substrate, or other fields, it irradiated with ultraviolet rays in the direction different from the above. Such an optical exposure process was repeated and orientation of said orienting film was carried out.

[0024]Where a fixed gap is maintained using a spacer, the two-sheet top and the lower substrate were joined, and the empty cell was manufactured. Then, the liquid crystal display element was completed by injecting a liquid crystal into said empty cell.

[0025]Since the UV irradiation process which used the photo mask in the case of the comparative example should be repetitively performed as mentioned above, it is dramatically troublesome. Since orientation treatment of the orienting film can be carried out only by one UV irradiation on the other hand in the case of an example, an orientation treatment process is dramatically simple.

[0026]

[Effect of the Invention]Since orientation of the orienting film will be carried out and it will be sold only at one optical exposure if orientation treatment of the orienting film is carried out by this invention, a manufacturing process can be shortened compared with the conventional case, and productivity improves.

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## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the schematic diagram side which showed the photo alignment method of the orienting film by a Prior art.

[Drawing 2] It is the schematic diagram side which showed the one photo alignment method of the orienting film by this invention.

[Description of Notations]

- 11 — Substrate
- 12 — Orienting film
- 13 — Photo mask
- 21 — Substrate
- 22 — Orienting film
- 23 — Prism

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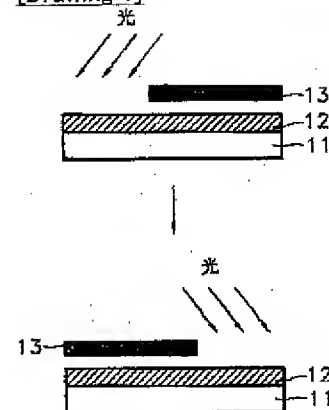
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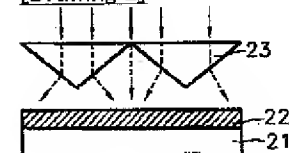
## DRAWINGS

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[Drawing 1]



[Drawing 2]



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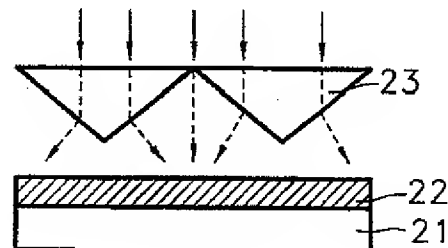
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(54) 【発明の名称】 液晶表示素子の配向膜の配向処理方法

(57) 【要約】

【課題】 工程の清潔性を保ち、かつ実施しやすい配向膜の配向処理方法を提供する。

【解決手段】 基板上に光配向性ポリマーよりなる配向膜を形成する段階と、光を多方向に放出させる光屈折手段を用いて前記基板であって前記配向膜を備える面に光を照射する段階とを含む。これにより、ただ1回の光照射で配向膜を配向させうるので、従来の場合に比べて製造工程が単純化でき、生産性が向上する。



## 【特許請求の範囲】

【請求項1】 基板上に光配向性ポリマーよりなる配向膜を形成する段階と、

光を多方向に放出させる光屈折手段を用いて前記基板であって前記配向膜を備える面に光を照射する段階とを含むことを特徴とする配向膜の配向処理方法。

【請求項2】 前記光屈折手段が多角錐状のプリズムであることを特徴とする請求項1に記載の配向膜の配向処理方法。

## 【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は液晶表示素子の配向膜の配向処理方法に係り、特に工程の清潔性を保ち、かつ実施しやすい配向膜の配向処理方法に関する。

【0002】

【従来の技術】通常の液晶表示素子は次のような構造を有する。

【0003】所定の間隔に離隔されて対向している上、下基板には透明電極層が形成されおり、この透明電極層の上部には液晶の配向のための配向膜(alignment layer)が形成されている。そして、前記上、下基板との配向膜の間には液晶層が形成されている。

【0004】前述したような液晶表示素子において、液晶の配列は外部の電圧印加の可否により変化し、このような液晶の配列変化により液晶表示素子に流入する外部の光が遮断及び透過される。即ち、前記透明電極層に電圧が印加されれば液晶層に電界が形成される。その結果、液晶は一定方向に配向し、液晶の配向の可否により表示素子の液晶の内部に流入する光が遮断または透過されてディスプレイスクリーン膜にイメージが具現されることになる。

【0005】このような液晶表示素子は液晶分子の配列特性に応じて光透過性、応答速度、視野角、コントラストのような特性が決定づけられる。従って、液晶分子の配向を均一に制御するのは非常に重要である。

【0006】液晶の均一な配向状態は単純に液晶を上、下基板間に介在させるのみでは得にくい。従って、前述した液晶表示素子の構造から分かるように透明電極層の上部に配向膜を形成することになる。

【0007】一般的に配向膜は、その製造工程中の最後の段階で配向処理されることにより液晶分子を配向させる機能を有することになる。このような配向処理方法としてはラビング方法が多用されてきた。即ち、基板上に高分子よりなる配向膜を形成した後、前記配向膜を特殊形態の布でラビングする段階よりなる。

【0008】最近に開発された方法としては、光を利用する配向法(光配向法)がある。図1に基づき光配向法を説明すれば次の通りである。

【0009】まず、基板11上に光配向性高分子よりなる配向膜12を形成する。フォトマスク13を用いて前記配向

膜12に光を局部的に照射すると該当領域の配向膜の光配向性高分子が配列される。その後、配向膜の他の領域に対してはフォトマスク13を用いて再び光を照射すべきである。

【0010】前述した配向処理方法のうち、ラビング法は実施しやすく工程が単純であり、一回に広い面積の液晶を配向処理しうる。しかし、ラビング時に使われた特殊形態の布から微細粒子または繊維素が離脱して配向膜を汚染させる恐れがある。そして、配向膜材料に応じて配向が良くならない場合もあり、ラビング時に発生する静電気により薄膜トランジスタが損傷する問題点がある。

【0011】光配向法は静電気が発生することなく、工程の清潔性が保たれる。しかし、前述したようにフォトマスクを用いた光照射段階を数回反復すべきなので製造上煩わしいという問題点がある。

【0012】

【発明が解決しようとする課題】本発明の目的は、前記問題点を解決して工程の清潔性が保たれると共に、実施しやすい配向膜の配向処理方法を提供することにある。

【0013】

【課題を解決するための手段】前記目的を達成するために本発明では、基板上に光配向性ポリマーよりなる配向膜を形成する段階と、光を多方向に放出させる光屈折手段を用いて前記基板であって前記配向膜を備える面に光を照射する段階とを含むことを特徴とする配向膜の配向処理方法を提供する。

【0014】前記光屈折手段としては、三角錐、四角錐などの多角錐状、三角柱、四角柱などの多角柱状または多角錐の先端部を切断した形のプリズムを用いることが好ましい。

【0015】前記光配向性ポリマーは特に制限されなく、ポリビニルシンナメート(polyvinyl cinnamate)、ポリビニルメトキシシンナメート(polyvinyl methoxycinnamate)、ポリイミドのような従来のフォトポリマー(photopolymer)を使用することが好ましい。

【0016】

【発明の実施の形態】図2に基づき本発明による配向膜の配向処理方法を説明する。

【0017】まず、基板21上に光配向性ポリマーよりなる配向膜22を形成する。光屈折手段の多角錐状のプリズム23を用いて光を照射する。ここで、前記プリズム23は入射光を多方向に屈折させる形を有している。

【0018】このような多角状のプリズムを用いて光を照射させると、光はプリズム23を通過して一定角度で配向膜22に照射して配向膜を配向させることになる。図2において、実線は入射光の経路を示し、点線はプリズムを通過した光の経路を示すものである。

【0019】以下、本発明を実施例に基づき詳しく説明するが、本発明が下記実施例にのみ限定されることでは

ない。

【0020】＜実施例＞ITO電極がコーティングされた上、下ガラス基板上にポリビニルシンナメート及びN-メチルピロリドンを含む組成物を塗布した後、乾燥させて配向膜を形成した。それから、前記基板の上部に四角錐状のプリズムを設置した後、約365nmの紫外線を照射した。

【0021】スペーサを用いて一定のギャップが保たれた状態で2枚の上、下基板を接合して空セルを製造した。その後、前記空セルに液晶を注入することにより液晶表示素子を完成した。

【0022】＜比較例＞ITO電極がコーティングされた上、下ガラス基板上にポリビニルシンナメート及びN-メチルピロリドンを含む組成物を塗布した後、乾燥させて配向膜を形成した。

【0023】それから前記基板の一侧あるいはある領域の上部にフォトマスクを位置させた後、約365nmの紫外線を照射した。次いで、前記基板の他側面あるいはその他の領域にフォトマスクを位置させた後、前記とは別の方向に紫外線を照射した。このような光照射過程を繰り返して前記配向膜を配向させた。

【0024】スペーサを用いて一定のギャップが保たれた状態で2枚の上、下基板を接合して空セルを製造し \*

た。その後、前記空セルに液晶を注入することにより液晶表示素子を完成した。

【0025】前述したように、比較例の場合にはフォトマスクを用いた紫外線照射過程を反復的に行うべきなので非常に煩わしい。反面、実施例の場合にはただ1回の紫外線照射で配向膜を配向処理するので配向処理工程が非常に単純である。

【0026】

【発明の効果】本発明により配向膜を配向処理すると、ただ1回の光照射で配向膜を配向させるるので、従来の場合に比べて製造工程が短縮でき、生産性が向上する。

【図面の簡単な説明】

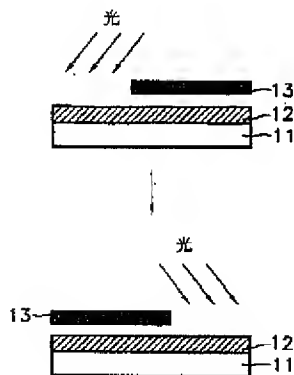
【図1】従来の技術による配向膜の光配向方法を示した概略図面である。

【図2】本発明による配向膜の一つの光配向方法を示した概略図面である。

【符号の説明】

- 11 --- 基板
- 12 --- 配向膜
- 13 --- フォトマスク
- 21 --- 基板
- 22 --- 配向膜
- 23 --- プリズム

【図1】



【図2】

